RESEARCH FILE

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The level of funding for university research in Canada and the United States: Comparative study[1]

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Introduction

This study, produced from official statistics, shows that Canada is steadily falling further behind the United States in resources devoted to university research. This widening gap is due primarily to caps on and even erosion of the budgets of Canada's federal agencies that provide research assistance, not, as the widespread perception holds, because of relatively low contributions from Canada's private sector. In fact, at the start of the study period (1984), Canadian universities obtained as many research contracts and grants from the private sector, proportionally, as American institutions. In subsequent years, this funding grew faster in Canada than in the United States. On the other hand, Canadian federal assistance was much lower than United States assistance in the mid-1980s, and grew at a slower pace in subsequent years.

Highlights

■ The gap between Canada and the United States in terms of resources invested in university research is widening. This is due primarily to caps on and even erosion of the budgets of Canada's federal granting agencies and not because of relatively low contributions from Canada's private sector.

■ In the United States as well as Canada, the federal government remains the largest source of support for university research. However, federal funding represents a much larger share of total support in the United States (73%), than in Canada (47%). In turn, the share of funding provided by the provinces (20%) and industry (17%) in Canada is larger than that provided by equivalent American sources, 9% and 8% respectively.

■ A key difference between the support provided by Canadian federal agencies (MRC, NSERC and SSHRC) and those in the United States (NIH and NSF) is that the Canadian sources do not cover indirect costs of the research. These indirect costs represented 21.9% of the research support provided by the NSF and 30.8 % of the research support provided to universities by the NIH.

■ The comparison of the average grants provided by the main federal agencies in both countries shows that American grants are three times larger than Canadian grants, even after adjusting for indirect costs. There are several explanations for this disparity. First, the level of federal support is lower in Canada than in the United States. Second, Canadian granting agencies tend to support a greater proportion of applications than their American counterparts.

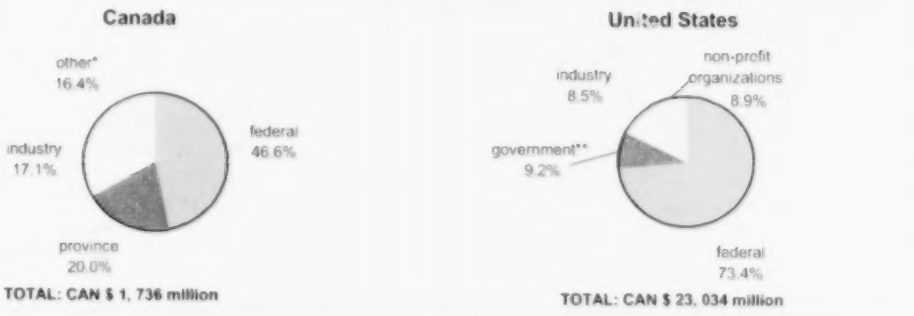
The official statistics that could extend the comparison beyond 1996 have not yet been published, but we can state that in terms of federal assistance for university research, the gap between Canada and the United States is widening. The budgets (in current dollars) of major Canadian agencies have continued to shrink, and budget data show that this trend was only reversed in 1998[2], while the budget of large American agencies have suffered no decline to date, although increases in some cases have barely kept pace with inflation[3]. In the following sections, we first examine the growth of all resources devoted to assisted and contract research in Canada and the United States. We then measure the average level of grants awarded to researchers by federal research assistance agencies in Canada and the United States.

Funding for research grants and contracts

In the United States as well as Canada, the federal government remains the largest source of funding for research grants and contracts in universities (Figure 1). However, federal grants represent a much larger share of total spending on research in American institutions (73.4 percent) than in Canadian institutions (46.6 percent). In turn, the share of funding provided by the provinces, industry and non-profit agencies in Canada is larger than that provided by their American counterparts. Overall, the research effort in the higher education sector has grown considerably in both countries over the past 12 years. Canada invested 0.192 percent of its GDP in 1984 and 0.218 percent in 1996. In turn, the United States devoted 0.190 percent in 1984 and 0.249 percent in 1996 (Figure 2).

It should be noted, however, that the United States effort has been sustained throughout the period, contrary to the Canadian effort, which experienced a period of decline between 1985 and 1987, followed by a period of spectacular growth between 1989 and 1993 and a new period of restrictions

FIGURE 1
CANADA & THE UNITED STATES
BREAKDOWN OF RESEARCH GRANTS AND CONTRACTS
IN UNIVERSITIES
BY SOURCE OF FUNDING, 1996



* Includes non-profit organizations and, to a lesser extent, funding from foreign sources.
** State and local governments.
Sources: **Canada** : Statistics Canada, Science Statistics Bulletin, Vol. 21, No. 8, August 1997, tab 3.
United States : NSB, Science & Engineering Indicators - 1998, (appendices) tab 4-3.

from 1994 to 1996. Also, despite the fact that the American effort levelled off in 1992 or 1993, Canada remains far behind in 1996.

The index in Figure 2 is accurate in that it shows the share of national wealth devoted to research support. It is also somewhat misleading, however, since the scores it posts (quotients) depend as much on external funding for university R&D (numerator) as on the performance of each nation's economy (denominator). To avoid this type of distortion created by differences in growth rates in the two national economies, we propose here a rule for comparison that is both simple and effective. It consists of reconciling the Canadian and United States numbers by keeping in mind the fact that in terms of population and size of the national economy, Canada represents about one tenth of the United States.

Under this rule, we find that the total value of grants and contracts to Canadian universities experienced two troughs during the period from 1984 to 1996 (Figure 3). The first, in 1987-1989, followed fairly quickly on a situation in which Canada almost achieved parity with the United States. The second, toward the end of the study period, created a gap between Canada and the United States that reached record proportions in 1996.

Since the federal government is the main source of funding, it also bears most of the responsibility in Canada for the increasing gap with the United States (Figure 4). In turn, the provincial governments, since at least 1984, and Canada's private sector, since 1991, have been making much larger contributions, proportionally, than their American counterparts.

Figure 5 illustrates the real growth (in constant dollars) of resources allocated to research in Canadian and American universities. We first note that between the late 1980s and the early 1990s, overall growth in

FIGURE 2
CANADA & THE UNITED STATES
RESEARCH GRANTS AND CONTRACTS
IN UNIVERSITIES AS A PROPORTION OF GDP,
1984-1996

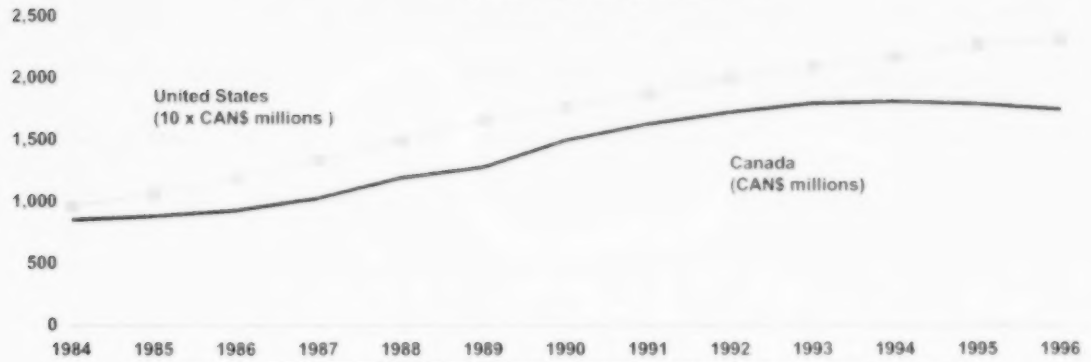
Sources: **Canada**: Stat. Can., CANSIM Data Bank, matrix 7790, label 160029 and Stat. Can., Science Statistics Bulletin, Vol. 21, No. 8, August 1997, tab 1, for GDP; Vol. 21, No. 9, August 1997, tab 2 and Stat. Can., Estimates of Canadian Research and Development Expenditure (GERD), Canada, 1986 to 1997 by province, 1986 to 1995, (ST-97-07), p. 15, for research grants and contracts expenditures. **United States**: NSB, Science & Engineering Indicators - 1998, (appendices) tab 4-1, for GDP; tab 4-3, for research grants and contracts.

research budgets slowed in American universities (from 6.71 to 2.93 percent) but even more in Canadian universities (from 5.82 to 1.14 percent). Throughout the period from 1984 to 1996, total support in the United States therefore continued to grow faster than in Canada.

than in the United States (3.04 percent). Over the same period, sponsored research from federal sources in Canada declined significantly (-1.53 percent), while those in the United States continued to post a respectable average growth of 3.16 percent.

expenses incurred by institutions to maintain research activities but not used directly (as their name indicates) for execution of a specific project. The indirect costs include general administration of research budgets, amortization and maintenance costs of the buildings where research activities are

FIGURE 3
CANADA & THE UNITED STATES
RESEARCH GRANTS AND CONTRACTS IN UNIVERSITIES
(IN CURRENT CAN$)* 1984-1996



Sources: **Canada**: Stat. Can.: Science Statistics Bulletin, Vol. 21, No. 8, August 1997, tab 3.
United States: NSB, Science & Engineering Indicators - 1998, (appendices) tab 4-3.
* **Amounts given in CAN$ millions for Canada and tens of CAN$ millions for the United States.**

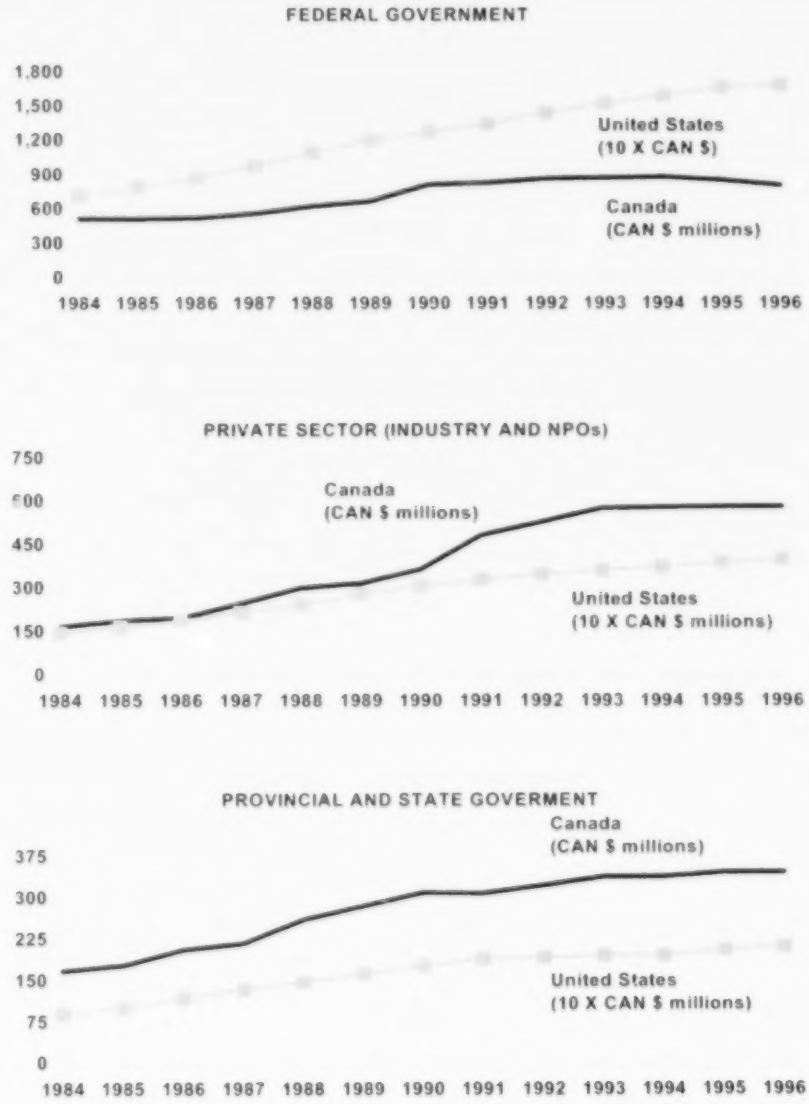
Our study of the growth in support from each source of funding also shows that Canada's lag is due essentially to the slow growth in government funds (federal, provincial and state), not in the growth of private funds (industry, etc.). It should be noted that between 1990 and 1996, funds from industry rose three times faster in Canada (9.82 percent)

Grants and contracts awarded by the federal governments

A key difference between grants from Canadian federal agencies (MRC, NSERC and SSHRC) and those in the United States (NIH and NSF) is that the Canadian grants do not cover the indirect costs of research -- those

conducted, library accessions, etc. Data on these indirect costs are fairly hard to find, but we do know that in 1994, they represented 21.9 percent of the United State's $1.7 billion granted to universities by the NSF and 30.8 percent of the United State's $5.8 billion granted to universities by the NIH[4].

FIGURE 4
CANADA AND THE UNITED STATES
SPONSORED AND CONTRACT RESEARCH SPENDING
IN UNIVERSITIES, BY FUNDING SOURCE
(CURRENT CAN$ MILLIONS),* 1984-1996



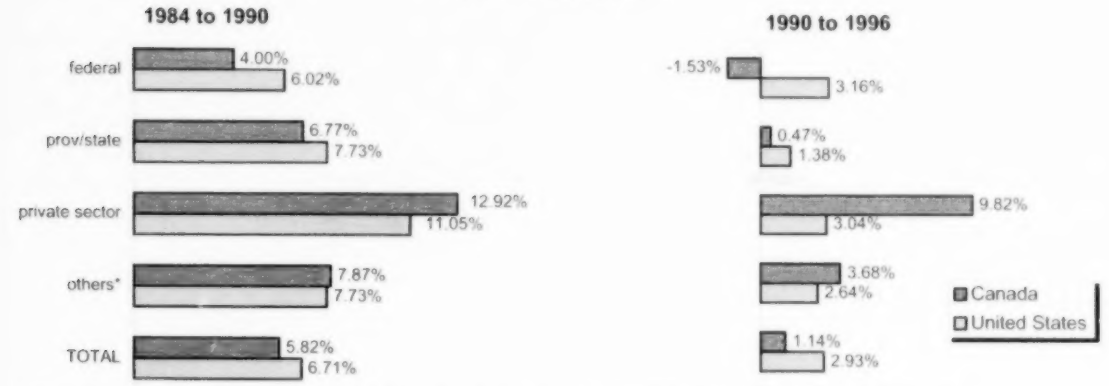
Sources: **Canada**: Stat. Can., Science Statistics Newsletter, Vol. 21, No. 8, August 1997, tab 3.
United States: NSB, Science & Engineering Indicators - 1998, (appendices) tab 4-3.
* **Amounts given in CAN$ millions for Canada and tens of CAN$ millions for the United States.**

Figure 6 compares average grants by Canadian agencies with those in the United States, from which we have subtracted indirect costs. This shows that American grants are still three times larger than Canadian grants, even after adjusting for indirect costs.

This enormous disparity between Canada and the United States has several explanations. First, the level of federal funding for university research, as we have seen from the outset, is lower overall in Canada than in the United States. Second, we also find that Canadian research assistance agencies tend to fund a higher proportion of applications than their American counterparts. When NSERC grants half the number of grants in Canada as those awarded in the United States by NSF, it approves proportionally more applications (7,447 compared with 14,397). However, since its budget is six times smaller than that of the NSF (CAN$357 million compared with CAN$2.15 billion), the slices of pie it serves obviously are much smaller. The same holds true for agencies dedicated to health research: although the gap between Canada and the United States in this instance is less dramatic in the number of grants approved, it is larger in the area of the overall budget. In 1995, for example, MRC approved 2,456 regular research grants from a total envelope of CAN$148 million, while NIH granted eight times more grants to "research projects" (19,834) from an envelope 40 times as large (CAN$6.1 billion).

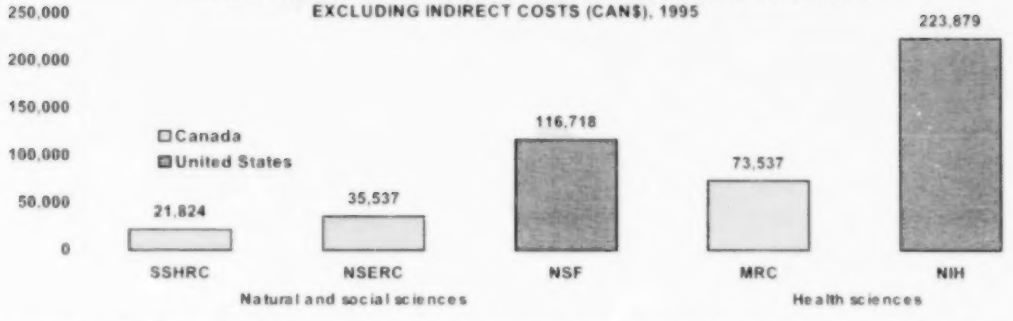
We should also point out that unlike Canadian grants, American grants serve to defray part of the lead researcher's salary for the proportion of time he/she devotes to carrying out the funded project. For example, a professor who earns an annual salary of $75,000 and who devotes one third of his/her time as lead researcher in a research project would have $25,000 subtracted from his/her grant and paid to his institution to offset his salary. Continuing our example, if the granting agency

FIGURE 5
CANADA & THE UNITED STATES
ANNUAL GROWTH RATE IN EXPENDITURE ON SPONSORED AND CONTRACT RESEARCH IN UNIVERSITIES BY FUNDING SOURCE
(RATE COMPUTED FROM AMOUNTS IN CONSTANT 1995 CAN$ AND US$)
1984-1990 AND 1990-1996



* Includes non-profit organizations and, to a lesser extent, funding from foreign sources.
Sources: **Canada**: Statistics Canada, Science Statistics Bulletin, Vol. 21, No. 8, August 1997, tab 3.
United States: NSB, Science & Engineering Indicators - 1998, (appendices) tab 4-3.

FIGURE 6
CANADA & THE UNITED STATES
AVERAGE RESEARCH GRANTS AWARDED BY MAJOR FEDERAL AGENCIES
EXCLUDING INDIRECT COSTS (CAN$), 1995



Sources: **SSHRC**, Program Information. Computed from the first year funding of research grants awarded in 1996. Calculation excludes grants in literature and fine art.
NSERC, List of Scholarships and Research Grants, 1995-1996. Computed from all active research grants in 1995.
NSF, NSF, State Award Summary Fiscal Year 1995 Award Report by State and Institution Fiscal Year 1995. Computed from all regular research grants awarded to institutions of higher learning for 1995. Excludes education and human resources programs and the two academic research infrastructure programs.
MRC, Report of the President — 1995-1996, p. 16. Computed from all research grants, including multidisciplinary research. Salary support and special projects. Excludes the scholarship and travel grants envelope.
NIH, NIH Extramural Data and Trends, FY 1956-1995, computed for all research grants awarded to institutions of higher learning. Includes research centres and other projects.

assessed the direct project costs at $120,000, this lead researcher in fact would only have $95,000 to pay for his assistants, consultants, equipment, publishing costs, etc. Thus, the gap between average grants in Canada and the United States does not translate directly into the difference between resources invested in research because of the differences in admissible costs. There can be no doubt, however, that American researchers experience much less difficulty than their Canadian colleagues negotiating release from their duties to devote time to the research work. In the United States, obtaining a research grant means that the institution is already paid for part of the professor's salary. In Canada, this means instead that the professor will have less time to devote to teaching and that the institution will have to offset this from its own operating budget.

In the same vein, we should add that payment of indirect costs by the granting agency provides little benefit from the researcher's point of view, so it is methodologically sound to subtract them from the American data, as we do in Figure 6. From the institution's perspective, however, these indirect costs in the United States are paid in real dollars for each grant obtained. We are also well aware that in Canada, universities experience much greater difficulty obtaining payment of indirect costs by governments and that these costs are assumed to be covered by the operating support provided by the provincial governments by the general operating envelope. This constitutes a genuine and significant difference that results in less financial affluence in Canadian universities.

Conclusion

The gap between Canada and the United States in resources invested in university research is growing. Low levels of federal investment, not shortfalls in private funding, are the main cause. In

proportional terms, as early as the mid-1980s, Canadian universities received at least as much money from the business sector as American institutions, and today, the proportion of private funding for university research is significantly higher in Canada than in the United States. In turn, federal government grants have been and continue to be much lower in Canada than in the United States.

With fewer resources than American research granting agencies, Canada's federal agencies still distribute more research grants. It follows that for each research project, the recipients of federal assistance receive approximately one third the level of real resources as their American counterparts.

Endnotes

1 This Research File is a summary of a report we submitted to AUCC. The full report contains more detailed statistics as well as explanations of our data processing methodology. To obtain a copy of this report, contact Ann Gratton at the AUCC Secretariat.

2 See: MRC, Performance Report, Period Ending March 31, 1997 — Medical Research Council of Canada, Ottawa, Treasury Board Secretariat, 1997, p. 8; NSERC, Performance Report, Period Ending March 31, 1997 — Natural Sciences and Engineering Research Council of Canada, Ottawa, Treasury Board Secretariat, 1997, p. 7; SSHRC, Performance Report, Period Ending March 31, 1997 — Social Sciences and Humanities Research Council of Canada, Ottawa, Treasury Board Secretariat, 1997, p. 8.

3 See: Colleen Cordes et al., "Clinton's Budget Proposal Highlights Spending on Science and Technology," The Chronicle of Higher Education, Vol. 44, No. 23, 13 February 1998, pp. A38-A42. Colleen Cordes et al., "The Clinton Budget: Small Increases for Most Science Agencies," The Chronicle of Higher Education, Vol. 43, No. 23, 14 February 1997, pp. A26-A31.

4 GAO, General Accounting Office, University Research: Effect of Indirect Cost Revisions and Options for Future Changes (Letter Report), Gaithersburg (MD), GAO Document Distribution Facility, GAO/RCED 95-74, 6 March 1995.